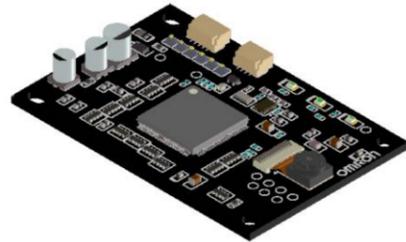




HVC-P Image Sensing Component HVC-P-S Model B5T-001001-S

INSTRUCTION SHEET

Thank you for purchasing the **HVC-P Image Sensing Component** (hereafter referred to as "The Product"). Please confirm that you have received the correct product. This Instruction Sheet provides specifications, handling methods, and safety precautions. Read and understand this Instruction Sheet before you use The Product. For detailed interface specifications for The Product, refer to the **HVC-P Command Specifications** document (provided separately). Keep this Instruction Sheet in a safe location.



OMRON Corporation

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Safety Precautions

● Definition of Precautionary Information

Caution Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury or in property damage.

Caution

- Observe all safety precautions and precautions for safe use when you use the product.
- Do not disassemble The Product or touch the board-mounted parts while power is being supplied. Also, do not connector or disconnect connectors while power is being supplied. Doing so may result in electrical shock.
- Do not touch the board-mounted parts with wet hands. Doing so may result in electrical shock or injury.
- Do not attempt to disassemble, repair, or modify the product. Do not disconnect the camera module connector. The inherent safety functions may be lost.
- Turn OFF the power supply before performing any work on The Product. The Product will become hot while power is supplied. Always turn OFF the power supply to The Product and wait for it to cool before performing any work on it.
- Observe all specifications and environmental conditions. Observe all specified values, including those for the power supply voltage and capacity. If you do not use The Product within specifications and conditions, electric shock, fire, or injury may occur. Do not short the connector pins.

Precautions for Safe Use

- Check the exterior of The Product as soon as you unpack it and make sure that there is no damage.
- To ensure safe use of The Product, observe the following precautions.
- Installation Environment
 - The internal parts may deteriorate or may be broken. Do not use The Product at temperatures outside of the ambient operating temperature range.
 - Do not use The Product in an environment where dew condensation occurs.

- Do not use The Product in an environment subject to contact with water, oil, or chemicals.
 - Do not use The Product in an environment where corrosive, explosive, or flammable gas is present.
 - Do not use The Product in locations subject to dust, dirt, salts, or iron powder.
- Power Supply and Wiring
 - Do not use connector CN1 and CN4 at the same time. Using both of them at the same time could damage the host.
 - Connector CN4 is sharp. Handle it with care.
 - Fire may possibly occur. Make sure that I/O terminals are wired correctly.
 - Do not connect an AC power supply to the DC power supply terminals.
 - Do not connect a DC voltage that exceeds the rated voltage.
 - Do not reverse the connection of the DC power supply.
 - Always turn OFF the power supply before connecting or disconnecting cables.
 - Do not connect a device that does not support serial stop-start synchronization to the connectors.
 - Before you connect a device to a connector, check the exterior of the device and make sure that there are no bent pins or other damage.
 - Other Precautions
 - Do not attempt to dismantle, repair, or modify The Product.
 - Dispose of The Product as industrial waste.
 - Use the mounting holes on the unit to mount it securely with M3 screws. Be careful not to deform or break the board when you tighten the screws. Determine and use a tightening torque that is suitable for the type of screws that you use.
 - Do not subject the unit to stress, such as twisting, bending, or shock. This may cause failure or deterioration.
 - During assembly, do not subject the connectors or surface-mounted parts to stress. This may cause failure or deterioration.

Precautions for Correct Use

- Observe the following precautions to prevent failure to operate and malfunctions and to prevent adversely affecting the performance and functions of The Product.
- Store The Product at a temperature of -30 to 70°C and a humidity of 90% or less.
 - Do not touch the board-mounted parts with your bare hands. Discharge any static electricity from your body before you touch The Product.
 - Properly connect the connector ground pin to prevent malfunction due to noise.
 - Do not use The Product at ambient temperatures outside of the rated range.
 - Do not use The Product in locations where it would be subjected to direct sunlight.
 - Do not use The Product in locations subject to excessive inductive or power supply noise, such as in strong magnetic or electric fields.
 - Do not use The Product in locations where it would be subjected to strong ultraviolet light.
 - Do not use The Product in locations where it might be subjected to radiation.
 - Sufficiently evaluate electrical characteristics of connections before you use The Product.
 - Always connect the connectors in the correct orientation.
 - Do not connect or disconnect the connectors while power is being supplied. Doing so may damage the product.
 - For detailed interface specifications, refer to the **HVC-P Command Specifications** document (provided separately).
 - Never use benzine, paint thinner, or any other volatile cleaning solutions or chemical wash cloths for cleaning.
 - Install The Product so that heat is effectively dissipated to improve and maintain the reliability of the product over a long period of time.
 - Install The Product sufficiently separated from surrounding charged parts.
 - Install The Product so that the detection range of the camera is not obstructed.
 - Use transparent materials to protect the front surface of the camera.
 - Always remove the protective sheet from the lens before you use The Product.
 - Do not touch the camera module.
 - Always reset The Product or cycle the power supply after changing SW2 DIP switch settings.
 - The Product performs detections on images. It may also detect objects other than living bodies, such as photographs and posters.
 - The Product uses a camera for detection. Detection may not be possible if the light direction, lighting conditions, and brightness are not suitable for the object being detected.
 - In case of a temporary power disruption or blackout, please make sure to reset The Product before using it once the power goes back on.
 - Please make sure to add The Product in a structural design with no external force applied on the SW1 reset switch.
 - It is recommended to save a backup of the Album data on the Host side too, as the Album data can be lost if the power is cut from the HVC-P when saving the Album data. Please refer to "HVC-P Command Specifications" for the detail.

Product Introduction

The Product is a human-sensing component that recognizes people. It is an integrated module that is built into other devices and provides both the following ten types of image sensing and a camera module:

Human Body Detection, Face Detection, Hand Detection, Face Direction Estimation, Gaze Estimation, Blink Estimation, Age Estimation, Gender Estimation, Expression Estimation and Face Recognition.

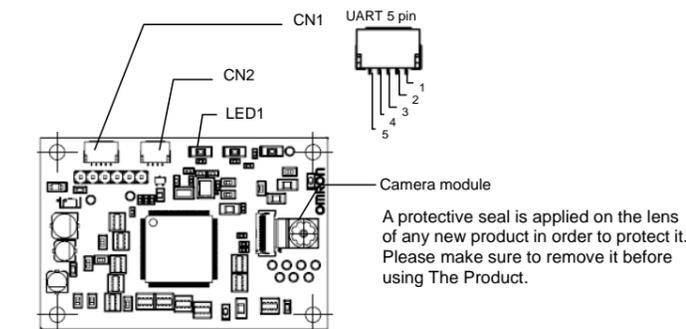
Commands are received from a host via a UART serial communications path and responses are returned.

Model

Model	Name
B5T-001001-S	HVC-P-S (sample) Image Sensing Component

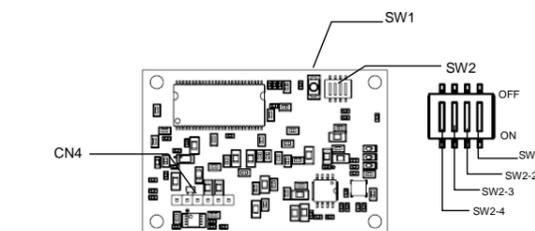
Parts Name and Functions

● Front



Signal	Name	Function
CN1	Connector 1	UART signal, power switch, reset input (cannot be connected simultaneously with CN4)
CN2	Connector 2	Not usable
LED1	LED1	Lit when power is ON

● Back



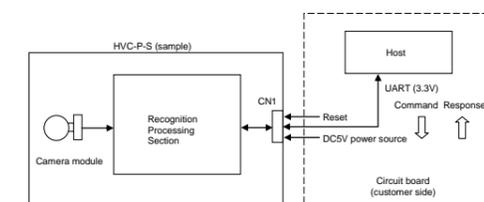
Signal	Name	Description
CN4	Connector 4	Reserved for HVC-P Evaluation Kit. (cannot be connected simultaneously with CN1)
SW1	Tact switch	Reset input for The Product
SW2	DIP switch	Transmission rate setting of the UART signal (*1)

(*1): DIP Switch SW2 setting.

The function of each bit is as follows:
 SW2-1: Fixed to ON (Please do not set it to OFF).
 SW2-2 to 2-4: Used to set the transmission rate setting of the UART signal.

Transmission rate (bps)	SW2-2	SW2-3	SW2-4
9,600	OFF	OFF	OFF
38,400	ON	OFF	OFF
115,200	OFF	ON	OFF
230,400	ON	ON	OFF
460,800	OFF	OFF	ON
921,600 (factory setting)	ON	OFF	ON

Block Diagram



Specifications and Functions

● Input Image Specifications

Item	Specifications
Resolution	640x480 pixels
Horizontal detection range (angle of view)	49+/-3deg
Vertical detection range (angle of view)	37+/-3deg
Optical axis angle range	+/-7deg
Alignment angle range	+/-3deg

● Output Image Specifications

Item	Specifications
Output image	No image / 160x120 pixels / 320x240 pixels (choose one)
Image format	RAW (8-bit, Y data)

● Image Sensing Functions

Function	Output	Details
Human Body Detection, Face Detection, Hand Detection	<ul style="list-style-type: none"> Number of detected objects Position (center coordinates) Size Degree of confidence 	<ul style="list-style-type: none"> Maximum of 35 per object type Coordinates on the screen from the top-left corner of the screen (in pixels) Pixel size on the input image Confidence in the detection result (0 to 1000), a higher value indicates a higher confidence
Face Direction Estimation	<ul style="list-style-type: none"> Yaw angle Pitch angle Roll angle Degree of confidence 	<ul style="list-style-type: none"> Positive to the right (in degrees) Positive upwards (in degrees) Positive clockwise (in degrees) Confidence in the estimation result (0 to 1000), a higher value indicates a higher confidence
Gaze Estimation	<ul style="list-style-type: none"> Yaw angle Pitch angle 	<ul style="list-style-type: none"> Positive to the right (in degrees) Positive upwards (in degrees)
Blink Estimation	<ul style="list-style-type: none"> Blink degree 	<ul style="list-style-type: none"> Output for both eyes (1 to 1000) A higher value indicates the eye is closer to being fully shut
Age Estimation	<ul style="list-style-type: none"> Age Degree of confidence 	<ul style="list-style-type: none"> 0 to 75 (75 includes higher ages) Confidence in the estimation result (0 to 1000), a higher value indicates a higher confidence
Gender Estimation	<ul style="list-style-type: none"> Gender Degree of confidence 	<ul style="list-style-type: none"> Male or female Confidence in the estimation result (0 to 1000), a higher value indicates a higher confidence
Expression Estimation	<ul style="list-style-type: none"> Score for 5 expressions Expression degree (positive or negative) 	<ul style="list-style-type: none"> 0 to 100 The score will be output for each expression ("neutral", "happiness", "surprise", "anger" and "sadness"). The score indicates the likeliness of a face displaying the estimated expression, where a higher score indicates a higher likeliness of being that expression. +100 to -100 A degree closer to +100 indicates a high degree of "happiness" while a degree closer to -100 indicates a high degree of "surprise", "anger" or "sadness".
Face Recognition	<ul style="list-style-type: none"> Individual identification result Score 	<ul style="list-style-type: none"> Displays the registered User ID, or "non-registered" for non-registered individuals Maximum number of users: 500 Matching degree (0 to 1000) The result of the user with the highest matching degree is output. A degree closer to 1000 indicates a higher likeliness of being that user

● Detection Distance (for reference*1)

Function	Maximum distance
Human Body Detection	2.8 meters
Hand Detection	1.5 meters
Face Detection, Face Direction Estimation, Gaze Estimation, Blink Estimation, Age Estimation, Gender Estimation, Expression Estimation, Face Recognition	1.3 meters

(*1) Caution: Please note that the detection and estimation performance will gradually fall when exceeding the maximum distance indicated for reference. Please note that being within the range indicated above does not always guarantee successful detection.

● Angle range (for reference *1)

Function	Pitch angle	Yaw angle	Roll angle
Human Body Detection	Up direction 15° Down direction -30° (*2)	360° (*3)	+/-10°
Hand Detection	+/-20°	+/-30°	
Face Detection	+/-30°	+/-90°	+/-45°
Face Direction Estimation	Face direction +/-20°	Face direction +/-30°	
Age Estimation			
Gender Estimation			
Blink Estimation			
Expression Estimation			
Face Recognition	Gaze angle +/-20° (*4) (up to +/-10° for face direction)	Gaze angle +/-30° (*4) Up to +/-20° for face direction	

(*1) The detection and estimation accuracy will fall when outside the specified angle range. Please note that being within range indicated above does not always guarantee successful detection.

(*2) "Up direction 15°" indicates that the camera is looking up to the target from a 15° downward angle and "Down direction -30°" indicates that the camera is looking down to the target from a 30° upward angle.

(*3) This indicates all the directions to the left and right of the human body.

(*4) This is the angle when facing the camera.

● Specifications for Signal with Host

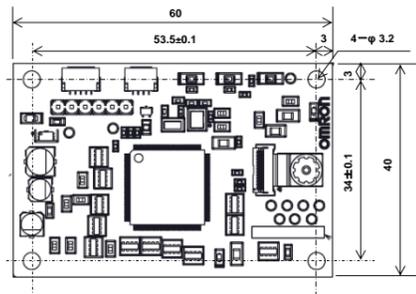
Item	Specifications
Outline	Receives the command controlling the module from the host and sends back the detection result info
Transmission system	Full-duplex bidirectional system
Transmission protocol	Non-procedure
Synchronization system	Asynchronous method
Data format	Start: 1 bit, Data: 8 bit, Stop: 1 bit, no parity
Transmission code	NRZ, Logic Low: 0V Logic High: 3.3V
Transmission speed	Please refer to the description of the DIP Switch SW2.

● Ratings

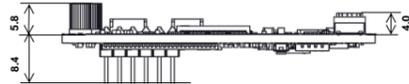
Item	Specifications
Power supply voltage	5V ±10%
Current consumption	Less than 0.25 A
Operating temperature	0 to +50°C (no condensation or freezing)
Operating humidity	Below 90% RH (no condensation or freezing)
Storage temperature	-30 to +70°C (no condensation or freezing)
Storage humidity	Below 90% RH (no condensation or freezing)

■ Board Dimensions (unit: mm)

● Front

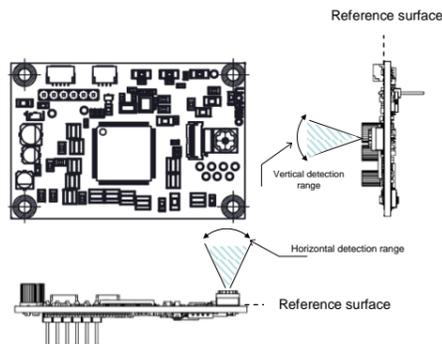


● Side

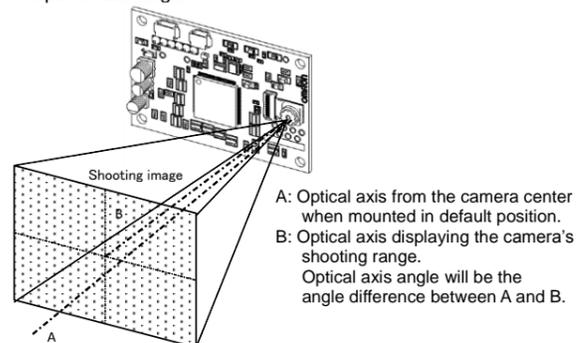


■ Definition of the image input specification

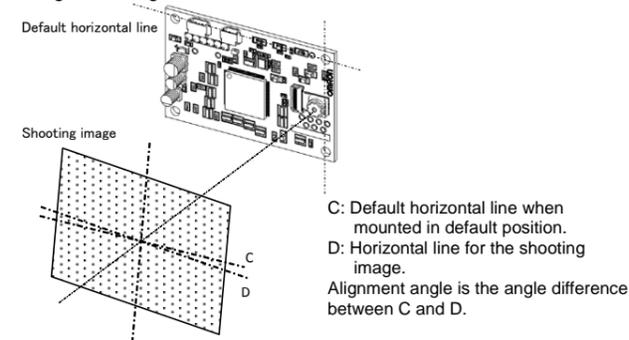
● Horizontal and vertical detection ranges.



● Optical axis angle

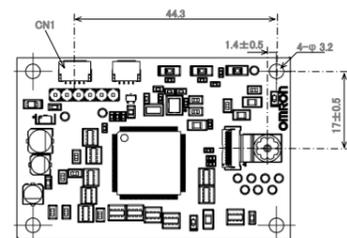


● Alignment angle

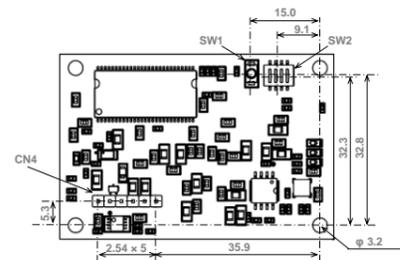


■ Component Layout Dimensions (unit: mm)

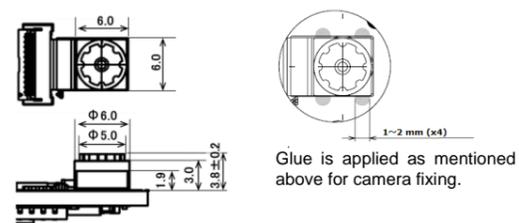
● Front



● Back



● Camera Device



■ Connector Pin Configuration

Please keep CN2 free of any connection.
 CN4 is reserved for the HVC-P Evaluation Kit.
 CN4 cannot be used simultaneously with CN1.

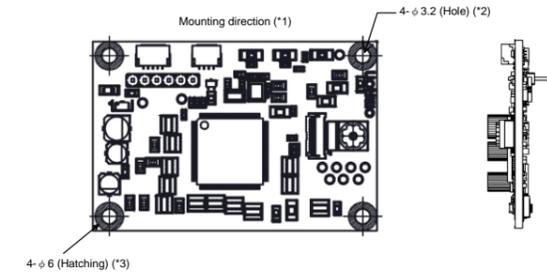
CN1 is used to connect to the power supply and the UART signal interface.
 Connector: SM05B-SRSS-TB (made by J.S.T. Mfg. Co. Ltd.)

Recommended connector on the other end:
 Housing: SHR-05V-S (made by J.S.T. Mfg. Co. Ltd.)
 Contact: SSH-003T-P0.2 (made by J.S.T. Mfg. Co. Ltd.)

Pin number	Signal	I/O	Description
1	Vcc	-	Power supply: 5.0V±10%
2	UART RX	Input	UART signal (from host to HVC-P-S (sample)) Logic 0: 0V Logic 1: 3.3V
3	UART TX	Output	UART signal (from HVC-P-S (sample) to host) Logic 0: 0V Logic 1: 3.3V
4	GND	-	Ground
5	RESET	Input	Reset signal (from host to HVC-P-S (sample)) Logic 0: 0V Logic 1: 3.3V Reset is active on logic 0

Caution: When turning ON The Product, please make sure that the RX terminal is not floating.

■ Mounting



- (*1) This figure is for a frontal mounting direction (0°) of the module.
 The software settings need to be changed when set to a 90°, 180° or 270° clockwise mounting direction from the front (0°).
- (*2) Use the M3 screws to fix the board in the four corners.
 Make sure to not bend or break the board when fixing the screws.
 Make sure to also use the tightening torques provided.
 Make sure to fix the board so that it is not warped, bent or any under unreasonable stress.
 Make sure that the board is sufficiently distanced from any electrically-conductive part.
- (*3) The φ6 (x4) hatching sections indicate the acceptable area for metallic components.
- (*4) Do not subject the board to stress, such as twisting or bending, when fixing it.
- (*5) Fix the board in a safe distance from the surrounding current-carrying elements.

Contact

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 Closed on weekends, and regular and company designated holidays.

The contents of the specification may change without notice.